Interim Report

ORSER-SSEL Technical Report 12-73

STORAGE AND RETRIEVAL OF ERTS AND UNDERFLIGHT IMAGERY

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(E73-11116) STORAGE AND RETRIEVAL OF ERTS AND UNDERFLIGHT IMAGERY Interim Report (Pennsylvania State Univ.) 10 p CSCL 05B HC $3.00

N73-33273

Unclas G3/13 01116

ERTS Investigation 082
Contract Number NAS 5-23133

INTERDISCIPLINARY APPLICATION AND INTERPRETATION OF ERTS DATA WITHIN THE SUSQUEHANNA RIVER BASIN

Resource Inventory, Land Use, and Pollution

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Date: May 1973

Original photography may be purchased from:
EROS Data Center
10th and Dakota Avenue
Sioux Falls, SD 57198

STORAGE AND RETRIEVAL OF ERTS AND UNDERFLIGHT IMAGERY

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All ERTS and underflight images are stored in the ORSER laboratory, Room 218 Electrical Engineering West. The laboratory contains two closets, one for internal publications (e.g., technical reports, descriptions of computer programs) and one for the storage of film rolls. There is a file cabinet in which are kept packing slips from imagery shipments, miscellaneous information about images and flights (e.g., flight logs), 35 mm slides used in lectures and classes in remote sensing, and hand-out materials which have been used in seminars or for general information to the public. Two map cabinets contain USGS quadrangle map coverage for all tracks of low altitude underflights. Aeronautical charts and maps at a scale of 1:250,000 cover the entire state of Pennsylvania and parts of the surrounding states and Canada. There are drawers for outsized ERTS images (e.g., "blow-ups") and images mounted for display purposes. Current flight line maps are posted on the bulletin boards, along with imagery and photomosaics in current use.

Storage

ERTS images for Pennsylvania are stored in plastic page protectors in large three-ring binders. They are filed in order of date, exposure time, and channel number. Black and white transparencies are filed first, then color composites, then contact paper prints. The first page in the binder is a copy of page 3-8 from the ERTS Data Users Handbook, explaining the alphanumeric annotation of bulk processed MSS images. A few images for scenes outside Pennsylvania are stored in their original envelopes in a file drawer. Images larger than 8 1/2 x 11 in. format (e.g., "blow-ups", framed color composites) are filed by date in a map drawer. Negatives in the 70 mm format are kept in 3 x 5 in. card file boxes, again filed by date, exposure time, and channel number.

Underflight film rolls are kept on shelves and arranged by flight date, flight line, and portion of the spectrum covered. Some 70 mm rolls which originally contained several flight lines have been separated into single flight lines and put on small reels, facilitating simultaneous

usage by persons interested in different areas. Rolls of film in the 9 x 9 in. format have not been so divided, due to their bulk and a limitation on storage space.

Retrieval

Information concerning ERTS and underflight data received by ORSER is kept in several large three-ring binders, blue for ERTS and red for underflights.

ERTS Imagery

The first page of the ERTS Key is a photocopy of page 3-80 of the ERTS Data Users Handbook, explaining the alphanumeric annotation of bulk processed MSS images. The second page is a table of statistics of ERTS and underflight imagery and MSS data, shown here as Table 1. Following the alphanumeric key and the table of data statistics, the ERTS Key is divided by dates into sections, one for each group of ERTS passes over Pennsylvania. For example, there is a section for September 4 through 8. The first page in this section is a base map of Pennsylvania (Figure 1) on which is plotted an outline of each scene for which ORSER has received imagery, with date and exposure time indicated. The second page in this section is an OZALID paper print[1] made from the channel 7 transparency of the earliest scene available in the September 4 through 8 series. Key geographic elements can be determined from this print, and the extent of cloud cover can be observed directly. With this print is a cover sheet indicating the formats in which this scene is available for study (e.g., transparencies in various channels, color composites, "blow-ups", 70 mm negatives, computer compatible tapes). There is an ozalid print and cover sheet of information for each scene within the September 4 through 8 sequence. The subsequent sections have the format described above. Each encompasses a series of passes comprising one complete coverage of Pennsylvania in five days. A separate section in the notebook includes an ozalid paper print and cover sheet for the few scenes outside of Pennsylvania that have been received. The final section in the ERTS Key is a guide to the use of the ERTS Standard Catalogues and accompanying microfilm.

[1] Such a print is attached as the final page of this report.

Table 1 : Remote Sensing Data Statistics

Satellite or Aircraft	Approx. Altitude	Sensor	Portion of Spectrum Covered (Micrometers)	Approx. Color Range	Designation	Study Format	Approximate Ground Area Covered in One Image	Approximate Scale	Approx. Ground Resolution (RS unit)
ERTS	500 miles	RBV	.475-.575 .580-.680 .698-.830	Blue-grn Grn-yel Red-IR	Channel 1 2 3	7x7 in. color composites	13,200 sq. miles	1"=15 miles or 1:1,000,000	150 ft
		MSS	.500-.600 .600-.700 .700-.800 .800-1.100	Green Or-red Red-IR Near IR	Channel 4 5 6 7	7x7 in. B&W transparancies and computer compatible tape	13,200 sq. miles	1"=15 miles or 1:1,000,000	260 ft
U2	65,000 feet	Cameras	.475-.575 .580-.680 .690-.760 .510-.900	Blue-grn Yel-red Red-IR Grn-IR	Sensors: 1 or 11 2 or 12 3 or 13 4 or 14	70 mm film in B&W and IR color	480 sq. miles	1"=7 miles or 1:445,000	60 ft
		MSS	70 mm scanner imagery available for selected areas in Pennsylvania						
C-130	5,000 to 15,000 feet	Cameras	.450-.705 .475-.585 .500-.900 .590-.710 .700-.930	All vis. Blue-grn Grn-IR Or-red Near IR	See indiv. flight line annotation	9x9 in. color transparancies 70 mm B&W and color transparancies	1.4 to 21 sq. miles 1.8 to 26 sq. miles	1"=700-2700 ft 1:6000-1:22,000 1"=2600-10,000 ft. 1:22,000-1:120,000	1-3 ft 3-30 ft
		MSS	.340-13.00	UV thru thermal IR	24 channels (Bendix Recorder)	Computer compatible tapes and 70 mm film	- A strip 1.3 to 5.2 miles wide	- -	10 ft 30 ft
C-54	5,000 to 15,000 feet	Cameras	.500-.900	Grn-IR	See individual flight line annotations	9x9 in. color IR transp.	1.5 to 20 sq. miles	1"=700-2700 ft 1:6000-1:22,000	1-3 ft
			.400-.475 .475-.585 .590-.930	Viol.-bl. Blue-grn Or.-IR		4x4 in. B&W transparancies	1.5 to 20 sq. miles	1"=1400-5400 ft 1:12,000-1:44,000	3-15 ft

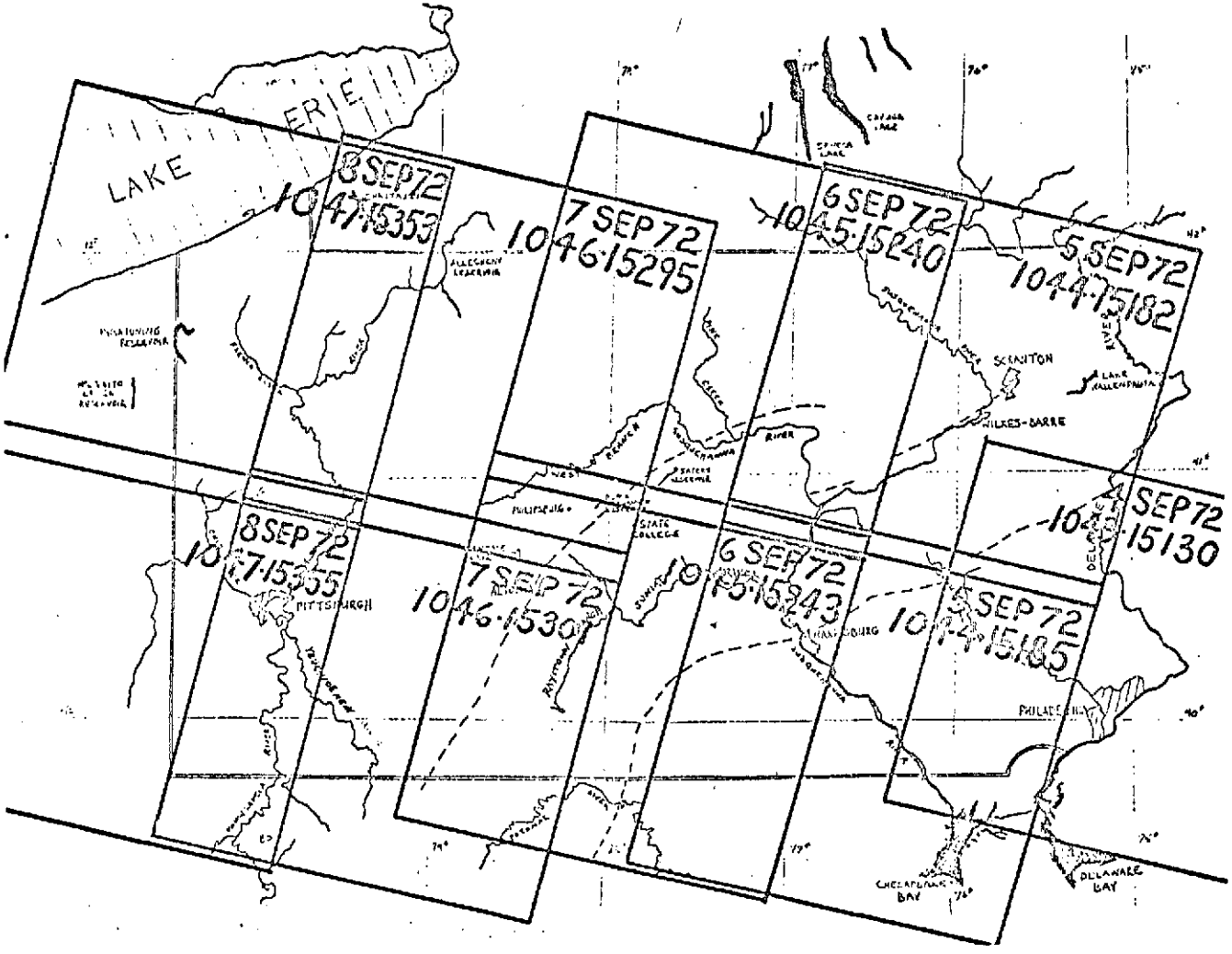

Figure 1: Typical track map for one sequence of ERTS-1 passes over Pennsylvania.

Underflight Data

The first page of the Underflight Key is a note informing potential users that additional information on underflights may be found in the file cabinet, filed under the specific flight type. The second page is a copy of the table of imagery statistics described in the ERTS Key discussion. The third page is an outline map of Pennsylvania on which are drawn flight lines for all underflight coverage of the state, to date, received by ORSER. After this preliminary section of the Underflight Key, the divisions of the notebook are according to flight type (primarily U2 and C130) and the seasons of flight.

The U2 information consists primarily of a data book for each flight, supplied by the Ames Research Center. The track maps provided at the back of each data book have been color-coded to indicate the presence or absence of clouds and haze; and frame numbers, at convenient intervals, have been added. Where flights cover areas in Pennsylvania, a separate annotation sheet has been prepared, indicating geographic locations in the state covered by the flight and the frame numbers on the film, from the various sensors, on which that location may be seen. All U2 flights within Pennsylvania are plotted on an outline map of the state, which is the first page encountered in the U2 section of the Underflight Key.

The C130 information in the Underflight Key consists of a series of information summary sheets, followed by a separate annotation sheet for each flight line. The following summary information is provided: 1) an outline map (see Figure 2) on which is plotted all the flight lines for the season covered by the C130 section following it; 2) a table of photographic information, indicating the portions of the spectrum covered by each camera, the film-filter combination used, the focal length, and similar information; 3) a chart listing the MSS channels and the portion of the spectral band covered by each channel; and 4) a table of MSS imagery and tapes which have been ordered and received. Individual annotation sheets for each flight line follow these summary pages. Each sheet lists key geographic locations on the flight line, with frame numbers for each roll of film on which the location appears (see Figure 3). The format of the photography, its altitude, and the portion of the spectrum covered, are also indicated on each of these sheets for each roll on which the

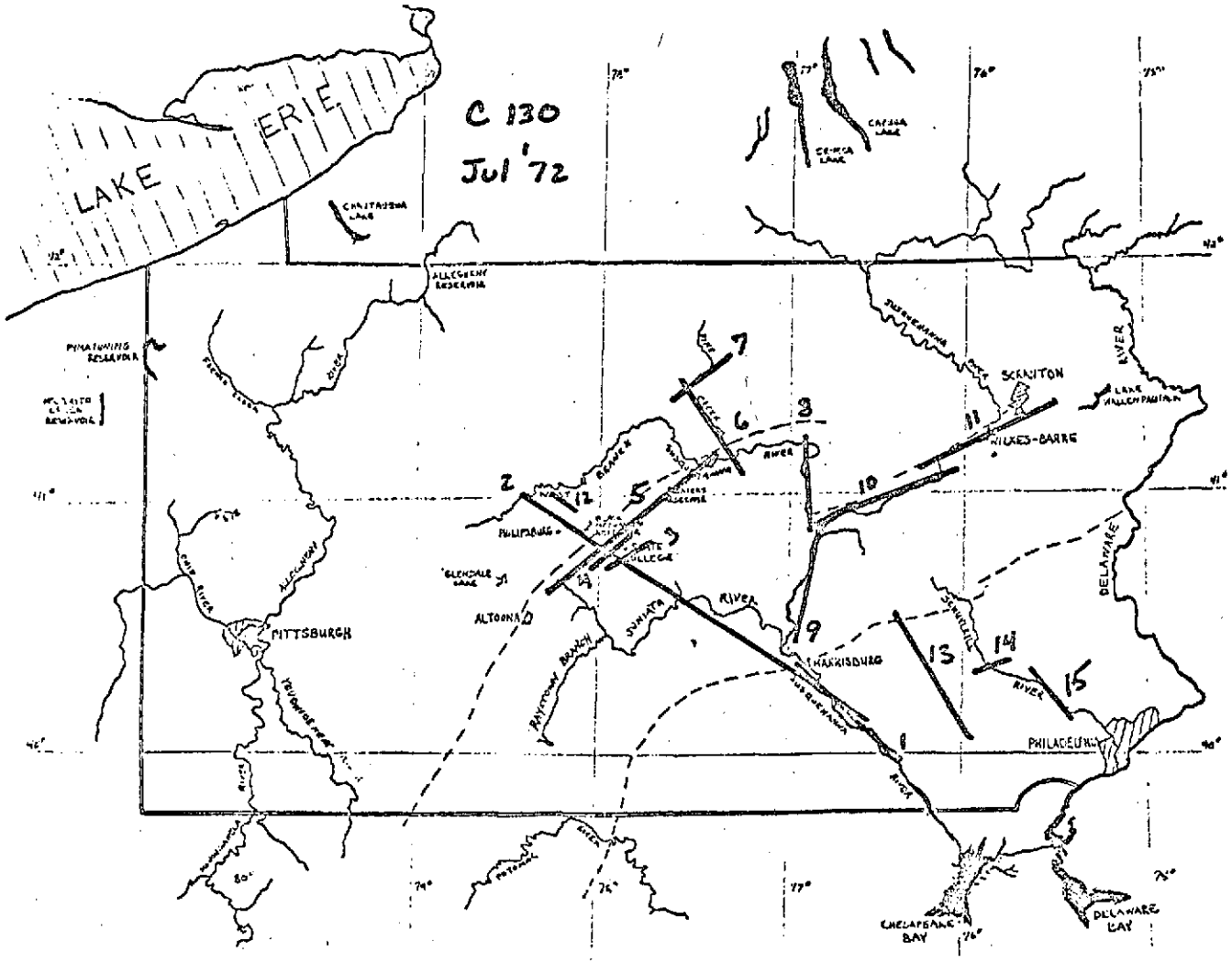

Figure 2: Typical track map for C130 flights.

IMAGERY COMPARISON IMAGERY C130 July '72 COVERAGE FLIGHT LINE #3 SKIMONT TO PA. FURNACE

R #	32	33	34	35	36	37	38
Format	9x9	9x9	70mm	———	———	———	———>
Band	450-705	500-900	500-900	475-585	590-710	700-930	400-700
Col/B&W	Color	Color	Color	B+W	B+W	B+W	Color
Altitude	45000ft	———	———	———	———	———	———>

General Remarks:
GENERALLY GOOD QUALITY
SOME UNDEREXPOSURE ON ROLL #38
MODERATELY HEAVY HAZE ON ROLL 35
VERY SLIGHT HAZE ON ROLLS 34 + 36

FRAME NUMBERS							Location	Remarks
155	155	145	145	145	193	174	STAKT AND SKIMONT	
158	158	148	148	148	197	177	BOALSBURG	
161	161	152	152	152	201	181	SHINGLETOWN	
167	167	157	157	157	212	186	PINE GROVE MILLS	
171	171	162	162	162	219	191	FAIRBROOK	
176	176	168	168	168	229	197	PA. FURNACE	
177	177	169	169	169	231	198	END	

Figure 3: Typical annotation sheet for a C130 flight line.

flight line appears. Data from C54 underflights are recorded in a manner similar to that for the C130 flights.

Borrowing Data Formats from ORSER

A 4 x 5 in. index card has been prepared for each image, roll of film, or single photographic frame from a film roll (if removed from the film strip). In the case of ERTS formats, the cards are color coded, with a different color for each format (e.g., blue for transparencies, yellow for 70 mm negatives). Each card contains a short description of the item, beneath which is a section with columns for "Date out", "Date in", and the name of the borrower.

When ERTS imagery or tapes are signed out, the borrower is provided with a form on which he is encouraged to indicate the categories of features of the scene which he has found of interest in the course of his research. Initially, he is also provided with a copy of page 4-15 and 4-16 of the ERTS Data Users Handbook listing the Earth Resources Vocabulary suggested for use in filling out ERTS Descriptors forms. The Descriptors forms are later filled out from the information provided by the users and sent to NASA.

Notification of Data Receipt

When new data is received, such as ERTS imagery, underflight film rolls, or computer tapes, the co-investigators on the project are notified within a few days. In the case of ERTS imagery, this notification takes the form of a base map of Pennsylvania on which an outline of the image scene or scenes is traced. The outline is then shaded to indicate cloud cover, if present. The date and exposure number of each image is provided, the available formats are described, and if there is a computer tape set available this is also indicated.

OZALID Print of an ERTS-1 Transparency